

IN THE CLAIMS:

1. (Previously Presented) A three-dimensional photographing apparatus comprising:

a photographing unit configured to photograph an object from a plurality of viewpoints; and

a projecting unit configured to project a pattern on the object in photographing, the projecting unit including an optical system having a projection view angle and a projection view angle adjusting unit configured to set or adjust the projection view angle,

wherein the projection view angle of the optical system is set or adjusted by the projection view angle adjusting unit in accordance with an overlapped area which is formed by overlapping photographing spaces capable of photographing the object from the viewpoints, so as to project the pattern within a range where the photographing unit is able to photograph the object and on the overlapped area.

2. (Original) The apparatus according to claim 1, wherein the projection view angle is set so as to project the pattern on an area which is smaller than the overlapped area and which includes at least the object.

3. (Original) The apparatus according to claim 1, wherein the apparatus further comprises a three-dimensional reconfiguring unit configured to three-dimensionally reconfigure images of the object using an image picked up by the photographing unit, and

the photographing view angle falls within a range which is measured by the three-dimensional reconfiguring unit and is set so as to project the pattern in an area which is included in the overlapped area.

4. (Original) The apparatus according to claim 1, wherein the photographing unit includes:

a camera having a photographing optical system; and

a stereo adapter configured to guide images viewed from the viewpoints to the photographing optical system.

5. (Canceled)

6. (Previously Presented) The apparatus according to claim 1, wherein the projection view angle adjusting unit adjusts a focal length of the optical system of the projecting unit and thus adjusts the projection view angle, and

the projecting unit further includes:

a light source configured to emit light to project the pattern, and

a projecting light source adjusting unit configured to correct an amount of light emitted from the light source, in accordance with the projection view angle adjusted by the projection view angle adjusting unit.

7. (Previously Presented) The apparatus according to claim 1, wherein a table showing a correspondence between a view angle of the photographing unit, relative positions of the viewpoints of the photographing unit, congestion angles of lines of sight from the viewpoints of the photographing unit, and the overlapped area is stored, and the projection view angle adjusting unit adjusts the projection view angle with reference to the stored table.

8. (Original) The apparatus according to claim 1, further comprising an illumination unit configured to illuminate the object in photographing, the illuminating unit including an optical system having an illumination angle,

wherein the projection view angle and the illumination angle of the optical system are set so as to project the pattern on an area which is smaller than the overlapped area and which includes at least the object, and the area is illuminated.

9. (Original) The apparatus according to claim 8, wherein the illuminating unit includes illumination angle adjusting unit configured to adjust the illumination angle in accordance with the overlapped area.

10. (Original) The apparatus according to claim 9, wherein the illumination angle adjusting unit adjusts a focal length of the optical system of the illuminating unit and thus adjusts the illumination angle, and

the illuminating unit further comprises;

a light source configured to emit light to illuminate the object, and

an illuminating light source adjusting unit configured to correct an amount of light emitted from the light source, in accordance with the illumination angle adjusted by the illumination angle adjusting unit.

11. (Original) The apparatus according to claim 9, wherein a table showing a correspondence between a view angle of the photographing unit, relative positions of the viewpoints of the photographing unit, congestion angles of lines of sight from the viewpoints, is stored, and the illumination angle adjusting unit adjusts the illumination angle with reference to the stored table.

12. (Previously Presented) A three-dimensional photographing apparatus comprising:

a photographing unit configured to photograph an object from a plurality of viewpoints; and

an illuminating unit configured to illuminate the object in photographing, the illuminating unit including an optical system having an illumination angle and an illumination angle adjusting unit configured to set or adjust the illumination angle,

wherein the illumination angle of the optical system is set or adjusted by the illumination angle adjusting unit in accordance with an overlapped area formed by overlapping photographing spaces capable of photographing the object from the viewpoints, so as to illuminate the overlapped area.

13. (Previously Presented) A photographing method of a three-dimensional photographing apparatus, comprising:

projecting a pattern on an object; and

photographing the object on which the pattern is projected, from a plurality of viewpoints,

wherein the projecting the pattern has a projection view angle which is set or adjusted in accordance with an overlapped area formed by overlapping photographing spaces capable of photographing the object from the viewpoints, so as to project the pattern on the overlapped area.

14. (Previously Presented) A photographing method of a three-dimensional photographing apparatus, comprising:

illuminating an object; and

photographing the illuminated object from a plurality of viewpoints,

wherein the illuminating the object has an illumination angle which is set or adjusted in accordance with an overlapped area formed by overlapping photographing spaces capable of photographing the object from the viewpoints, so as to illuminate the overlapped area.

15. (Currently Amended) A stereo adapter comprising:

an optical path splitting optical system configured to guide images of an object viewed from first and second viewpoints that differ from each other to a photographing optical system of a photographing unit connected to the stereo adapter to acquire a stereo image of the object; and

a projecting unit configured to project a pattern on the object in photographing, the projecting unit including an optical system having a projection view angle and a projection view angle adjusting unit configured to set or adjust the projection view angle;

wherein when one of two boundary lines delimiting a field of view from the first viewpoint which is closer to the second viewpoint is defined as a first boundary line, one of two boundary lines delimiting a field of view from the second viewpoint which is closer to the first viewpoint is defined as a second boundary line, and the first boundary line and the second boundary line intersect at an intersection point, the projecting unit projects the pattern at the projection view angle set or adjusted by the projection view angle adjusting unit in accordance with an area in which all points are distant from the intersection point with respect to the photographing optical system, the area being one of areas delimited by the first boundary line and the second boundary line with the intersection point at a top.

16. (Currently Amended) A stereo adapter comprising:

an optical path splitting optical system configured to guide images of an object viewed from first and second viewpoints that differ from each other to a photographing optical

system of a photographing unit connected to the stereo adapter to acquire a stereo image of the object; and

an illuminating unit configured to illuminate the object in photographing, the illuminating unit including an optical system having an illumination angle and an illumination angle adjusting unit configured to set or adjust the illumination angle;

wherein when one of two boundary lines delimiting a field of view from the first viewpoint which is closer to the second viewpoint is defined as a first boundary line, one of two boundary lines delimiting a field of view from the second viewpoint which is closer to the first viewpoint is defined as a second boundary line, and the first boundary line and the second boundary line intersect at an intersection point, the illuminating unit illuminates the object at the illumination angle set or adjusted by the illumination angle adjusting unit in accordance with an area in which all points are distant from the intersection point with respect to the photographing optical system, the area being one of areas delimited by the first boundary line and the second boundary line with the intersection point at a top.

17. (Currently Amended) A three-dimensional photographing apparatus comprising:

a photographing unit configured to photograph an object from a first viewpoint and a second viewpoint that is located at a given distance from the first viewpoint, the photographing unit including a photographing optical system; and

a projecting unit configured to project a pattern on the object in photographing, the projecting unit including an optical system having a projection view angle and a projection view angle adjusting unit configured to set or adjust the projection view angle;

wherein when one of two boundary lines delimiting a field of view from the first viewpoint which is closer to the second viewpoint is defined as a first boundary line, one of two boundary lines delimiting a field of view from the second viewpoint which is closer to the first viewpoint is defined as a second boundary line, and the first boundary line and the second boundary line intersect at an intersection point, the projecting unit projects the pattern at the projection view angle set or adjusted by the projection view angle adjusting unit, in accordance with an area in which all points are distant from the intersection point with respect to the photographing optical system, the area being one of areas delimited by the first boundary line and the second boundary line with the intersection point at a top.

18. (Currently Amended) A three-dimensional photographing apparatus comprising:

a photographing unit configured to photograph an object from a first viewpoint and a second viewpoint that is located at a given distance from the first viewpoint, the photographing unit including a photographing optical system; and

an illuminating unit configured to illuminate the object in photographing, the illuminating unit including an optical system having an illumination angle and an illumination angle adjusting unit configured to set or adjust the illumination angle;

wherein when one of two boundary lines delimiting a field of view from the first viewpoint which is closer to the second viewpoint is defined as a first boundary line, one of two boundary lines delimiting a field of view from the second viewpoint which is closer to the first viewpoint is defined as the second boundary line, and the first boundary line and the second boundary line intersect at an intersection point, the illuminating unit illuminates the object at the illumination angle set or adjusted by the illumination angle adjusting unit, in accordance with an

area in which all points are distant from the intersection point with respect to the photographing optical system, the area being one of areas delimited by the first boundary line and the second boundary line with the intersection point at a top.

19. (Original) A stereo adapter connected to a photographing unit having a photographing optical system for three-dimensional photography, comprising:

an optical path splitting optical system configured to guide images of an object viewed from a plurality of viewpoints to the photographing optical system of the photographing unit connected to the stereo adapter;

at least one of a projecting unit configured to project a pattern on the object in photographing and an illumination unit configured to illuminate the object in photographing; and

an illumination angle designating value changing unit configured to receive illumination angle information for illumination, which corresponds to a photographing view angle of the photographing unit connected to the stereo adapter, from the photographing unit and conform the received illumination angle information to a characteristic of the optical path splitting optical system, thereby to control at least one of a projection view angle of the projecting unit and an illumination angle of the illuminating unit.

20. (Previously Presented) A three-dimensional photographing apparatus comprising:

photographing means for photographing an object from a plurality of viewpoints;

and

projecting means for projecting a pattern on the object in photographing, the projecting means including an optical system having a projection view angle and projection view angle adjusting means for setting or adjusting the projection view angle,

wherein the projection view angle of the optical system is set or adjusted by the projection view angle adjusting means in accordance with an overlapped area which is formed by overlapping photographing spaces capable of photographing the object from the viewpoints, so as to project the pattern within a range where the photographing means is able to photograph the object and on the overlapped area.

21. (Previously Presented) A three-dimensional photographing apparatus comprising:

photographing means for photographing an object from a plurality of viewpoints; and illuminating means for illuminating the object in photographing, the illuminating means including an optical system having an illumination angle and illumination angle adjusting means for setting or adjusting the illumination angle,

wherein the illumination angle of the optical system is set or adjusted by the illumination angle adjusting means in accordance with an overlapped area formed by overlapping photographing spaces capable of photographing the object from the viewpoints and which includes at least the object, so as to illuminate the overlapped area.

22. (Currently Amended) A stereo adapter comprising:

an optical path splitting optical system for guiding images of an object viewed from first and second viewpoints that differ from each other to a photographing optical system of photographing means connected to the stereo adapter to acquire a stereo image of the object; and

projecting means for projecting a pattern on the object in photographing, the projecting means including an optical system having a projection view angle and projection view angle adjusting means for setting or adjusting the projection view angle;

wherein when one of two boundary lines delimiting a field of view from the first viewpoint which is closer to the second viewpoint is defined as a first boundary line, one of two boundary lines delimiting a field of view from the second viewpoint which is closer to the first viewpoint is defined as a second boundary line, and the first boundary line and the second boundary line intersect at an intersection point, the projecting means projects the pattern at the projection view angle set or adjusted by the projection view angle adjusting means, in accordance with an area in which all points are distant from the intersection point with respect to the photographing optical system, the area being one of areas delimited by the first boundary line and the second boundary line with the intersection point at a top.

23. (Currently Amended) A stereo adapter comprising:

an optical path splitting optical system for guiding images of an object viewed from first and second viewpoints that differ from each other to a photographing optical system of photographing means connected to the stereo adapter to acquire a stereo image of the object; and

illuminating means for illuminating the object in photographing, the illuminating means including an optical system having an illumination angle and illumination angle adjusting means for setting or adjusting the illumination angle;

wherein when one of two boundary lines delimiting a field of view from the first viewpoint which is closer to the second viewpoint is defined as a first boundary line, one of two boundary lines delimiting a field of view from the second viewpoint which is closer to the first viewpoint is defined as a second boundary line, and the first boundary line and the second boundary line intersect at an intersection point, the illuminating means illuminates the object at the illumination angle set or adjusted by the illumination angle adjusting means, in accordance with an area in which all points are distant from the intersection point with respect to the

photographing optical system, the area being one of areas delimited by the first boundary line and the second boundary line with the intersection point at a top.

24. (Currently Amended) A three-dimensional photographing apparatus comprising:

photographing means for photographing an object from a first viewpoint and a second viewpoint that is located at a given distance from the first viewpoint, the photographing means including a photographing optical system; and

projecting means for projecting a pattern on the object in photographing, the projecting means including an optical system having a projection view angle and projection view angle adjusting means for setting or adjusting the projection view angle;

wherein when one of two boundary lines delimiting a field of view from the first viewpoint which is closer to the second viewpoint is defined as a first boundary line, one of two boundary lines delimiting a field of view from the second viewpoint which is closer to the first viewpoint is defined as a second boundary line, and the first boundary line and the second boundary line intersect at an intersection point, the projecting means projects the pattern at the projection view angle set or adjusted by the projection view angle adjusting means, in accordance with an area in which all points are distant from the intersection point with respect to the photographing optical system, the area being one of areas delimited by the first boundary line and the second boundary line with the intersection point at a top.

25. (Currently Amended) A three-dimensional photographing apparatus comprising:

photographing means for photographing an object from a first viewpoint and a second viewpoint that is located at a given distance from the first viewpoint, the photographing means including a photographing optical system; and

illuminating means for illuminating the object in photographing, the illuminating means including an optical system having an illumination angle and illumination angle adjusting means for setting or adjusting the illumination angle;

wherein when one of two boundary lines delimiting a field of view from the first viewpoint which is closer to the second viewpoint is defined as a first boundary line, one of two boundary lines delimiting a field of view from the second viewpoint which is closer to the first viewpoint is defined as a second boundary line, and the first boundary line and the second boundary line intersect at an intersection point, the illuminating means illuminates the object at the illumination angle set or adjusted by the illumination angle adjusting means in accordance with an area in which all points are distant from the intersection point with respect to the photographing optical system, the area being one of areas delimited by the first boundary line and the second boundary line with the intersection point at a top.

26. (Original) A stereo adapter connected to a photographing unit having a photographing optical system for three-dimensional photography, comprising:

an optical path splitting optical system for guiding images of an object viewed from a plurality of viewpoints to the photographing optical system of the photographing unit connected to the stereo adapter;

at least one of projecting means for projecting a pattern on the object in photographing and illuminating means for illuminating the object in photographing; and

illumination angle designating value changing means for receiving illumination angle information for illumination, which corresponds to a photographing view angle of the photographing unit connected to the stereo adapter, from the photographing unit and conforming the received illumination angle information to a characteristic of the optical path splitting optical system, thereby to control at least one of a projection view angle of the projecting means and an illumination angle of the illumination means.